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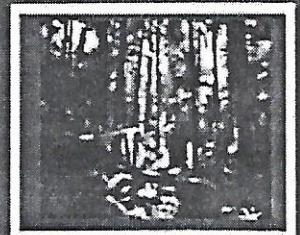
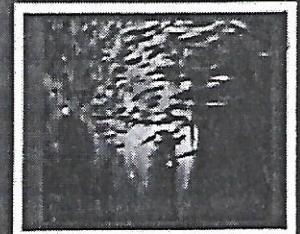
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Rainfall Trend in Osmanabad (Marathwada) and Satara (W. Maharashtra) Districts in Maharashtra: A Comparative Study

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Jawahar College, Anadur, Dist. Osmanabad

Abstract

Rainfall is the most important single factor determines the success or failure of agriculture and affects the availability of water resources. The proper understanding of precipitation pattern and its trends may help water resources development and take decisions for the developmental activities of that place. In view of this the present attempt was made to analyze spatial pattern and distribution of rainfall variability. Present analysis includes the spatial variations of rainfall in Osmanabad and Satara district of Maharashtra. The study was used 50 years, average yearly rainfall data from 1970 to 2019. Overall, there is a big difference in the average rainfall of Osmanabad and Satara districts. The average rainfall of Satara district is double that of Osmanabad district from the entire period.

Keywords:- Annual rainfall, Coefficient of variation, Rainfall variability, spatial variation

Introduction:-

Rainfall as the primary ecological parameter has created variety of farming enterprises, types or systems in the world. It is the dominant single weather element influencing the intensity and location of farming systems and the farmer's choice of enterprises. It also becomes a climatic hazard to farming when it is characterized with scantiness, concentration, intensity, variability, and unreliability, it is more important in the minimal regions, where average or normal rain fall is generally necessary for successful crop production. In such area the system of crop production must be correlated more or less to the moisture factor (Klages K.H.W., 1958). About more than 84 percent of the annual rainfall in the region is received during the south-west monsoon season, the rainiest month being June, July gets the heaviest rainfall in the North east, while during the retreating Monsoon, rainfall in September becomes more important in the East. The South-West monsoon is the pivot around which almost the entire farm life and economy swings.

Rainfall is one of the major climatic factors influencing agriculture. The crop production and productivity depends on the amount of rainfall received, intensity and distribution of the rainfall over a particular area during particular year which indicates the growth of the economy of the country and affect both the spatial and temporal patterns on water availability (Find et al. 2014). Rainfall characteristics over an area vary from one part to another so analysis of the rainfall pattern is an important to understand the micro-level variability which in turn useful to planning the agriculture; land and water development activities for future use. Hence understanding its nature and trend at any place has a great significance in water storage for future use. Under changing climate the variability of rainfall significantly insufficient was observed past years in developing and under developed countries (Thornton et al. 2014). Deviation of rainfall from the mean or the ratio of standard deviation to the mean or the variability of coefficient of variation is called rainfall variability, the study of the rainfall variability and its trends is a good tool for the policy makers for

agricultural planning, water resource assessment, hazard mapping, flood frequency analysis etc. India gets rainfall through South-west monsoon during June to September and North-east monsoon during October to December. The intra-seasonal and inter annual variability of the summer monsoon has a great impact on agriculture (Krishnamurthy and Kinter 2002). In addition to rainfall spatial variability modeling is an important element in predicting the rainfall distribution and to predict the precipitation relates with other climatic elements. Hence, environmental management and research need this rainfall change as a rule for realizing many processes. Therefore, spatial variation modeling of monthly precipitation, are of interest for climatologists and hydrologist. Different interpolation methods have been used for modeling the geo-statistical patterns of precipitation. The most widely used interpolation methods are deterministic and geo-statistical methods, deterministic interpolation techniques, global and local models. Importance of monsoon to Indian economy and as major global circulation parameter has motivated many scientists to study the variability of Indian monsoon variability across the country, in the past. Rainfall has been rigorously examined by several researchers, notably by Parthasarathy and Dhar (1976), Wang et al. (2015), Gouda et al. (2017). It is also important to know the relationship between monsoons and ocean atmospheric processes variability studies are having great significance.

The present study was made to understanding the rainfall variability rainfall incidence of Osmanabad and Satara districts in Maharashtra with the following objectives are; to find out and analyze the spatial distribution, rainfall variations in Osmanabad and Satara districts from 1970 to 2019.

Study Region

The Osmanabad district is located in Maharashtra state. It is located on east side of Marathwada region. The latitudinal extent of study area is $17^{\circ}35'$ to $18^{\circ}40'$ north and longitudinal extend between $75^{\circ}16'$ to $76^{\circ}40'$ east. The total area of district is 7512.4sq.km. It is situated about 600 m above mean sea level. Manjra and Terna are major are seasonal river mainly flow in rainy season. Temple of goddess Tuljabhavani at Tuljapur is famous in India. There are eight tahsil in the district. The Osmanabad district comes under drought prone area. Average annual rainfall in within the district is 780mm. The total population of study area is 1,486,586.

The Satara district is one of the important districts of the Maharashtra state well known for agricultural development. In addition, the agricultural and rural based cultural wisdom and closeness of the author, with all these motivated the researcher to undertake the present study. The Satara district is situated in west part in Maharashtra state. This district consist eleven tahsil with 1,727 villages. The total area is covered with 10,480 sq.km and extending between $17^{\circ}05'$ and $18^{\circ}11'$ North latitudes and $73^{\circ}33'$ to $74^{\circ}54'$ East longitudes. According to the census of 2011 Satara district has a population of 3,003,741. The climate ranges from the rainiest in the Mahabaleshwar region, which has an average annual all of over 6000 mm to the driest in Man tahsil where the average annual rainfall is about 500 mm.

Objectives

The present study has been undertaken with following specific objectives.

1. To study the average annual rainfall during the year 1970 to 2019 in study area.
2. To find out trends of rainfall and coefficient of variations.


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Database And Methodology

The present study is based on secondary source of data it has collected from Indian Metrological Department for 50 years. Agricultural Statistical Information State, Socio Economic Review Osmanabad and Satara Districts and Agricultural District Office, The data has been collected from 1970 to 2019. The trends of rainfall is calculated and represent by mean, Standard Deviation, and Coefficient of Variation in percentage of rainfall in Osmanabad and Satara Districts shows the presentation of result chart, graph method is used.

The co-efficient of rainfall variability is calculated by the following formula.

$$\text{Co-efficient of Rainfall Variability} = \frac{\text{S.D.}}{\text{Mean}} \times 100$$

Where SD = the standard deviation.

Mean = the Arithmetic mean of rainfall during the 50 years.

Results And Discussion

1) Annual Rainfall Distribution:

For study average annual rainfall (mm) of Osmanabad and Satara districts of Maharashtra, from 1970 to 2019 was calculated. Average 780.26 mm rainfall in osmanabad district and 1420.04 mm rainfall in Satara district was observed. Table no. 1 clearly shows the annual rainfall of Osmanabad and Satara district of Maharashtra state.

Table No. 1 Average Annual Rainfalls in mm Osmanabad&Satara Districts, 1970 to 2019

Sr. No.	Year	Osmanabad District	Satara District	Sr. No.	Year	Osmanabad District	Satara District	
1	1970	680.6	1438.3	27	1996	818.1	1617.3	
2	1971	710.2	1375.3	28	1997	571.2	1932.2	
3	1972	452.3	883.6	29	1998	1262.6	1646.3	
4	1973	725.3	1813.3	30	1999	710.3	1305.8	
5	1974	890.4	1561.3	31	2000	958.3	1251.6	
6	1975	729.7	1939.8	32	2001	613.2	1067.8	
7	1976	840.9	2072.2	33	2002	549.4	987.3	
8	1977	940.2	1533.2	34	2003	523.4	804.3	
9	1978	784.8	1385.4	35	2004	609.4	1410.1	
10	1979	858.1	1759.8	36	2005	619.5	2087.7	
11	1980	922.7	1344.6	37	2006	675.3	1950.9	
12	1981	745.5	1715.2	38	2007	932.5	1510.7	
13	1982	613.6	1087.4	39	2008	771.6	1169.5	
14	1983	1017.4	1518.2	40	2009	764.4	1136.5	
15	1984	505.6	1592.6	41	2010	1070.2	1297.2	
16	1985	693.9	1239.9	42	2011	1002.5	1283.2	
17	1986	682.4	1373.9	43	2012	538.83	931.8	
18	1987	712.7	1239.3	44	2013	767.46	1129.4	
19	1988	1304.9	1845.3	45	2014	822.4	775.3	
20	1989	1288.5	1436.9	46	2015	844.5	922.5	
21	1990	1081.6	1689.4	47	2016	723.6	1150.5	
22	1991	484.3	1606.1	48	2017	801.6	1410.6	
23	1992	493.7	1492.7	49	2018	923.4	1280.3	
24	1993	932.5	1316.6	50	2019	861.3	1368.5	
25	1994	521.8	2109.9					
26	1995	664.8	1204.9					
						Mean	779.9384615	1522.11923
						S. D.	225.864193	293.617771
						C. V.	28.96	19.29

Source: Computed by the Researcher, based on socio-economic reviews and district

statistical abstract 1970 to 2019

II) Rainfall Trend in Osmanabad District (1970-2019):-

The average annual rainfall for Osmanabad district is 779.93 mm and Co-efficient of Rainfall Variability is 28.96%. The data gotten on the average annual rainfall of Osmanabad district for the period in five decade viz. 1980, 1990 and 2000, 2010 and 2019 were analyzed by simple tabular method. The proportion were estimated for each of the below years to know the variation in the rainfall of the Osmanabad district for period under the study. As the result of the rainfall variability in the Osmanabaddistrict. During the period 1970-2019, the difference of the actual average rainfall and trend of the rainfall in Osmanabad district was decline rate because of first ten year rainfall analysis the trend line is goes plain direction, but after the about tenure the trend line was very changeable. The above Table No 1 and Fig No 3 show that the actual line and trend line of increasing is negative and positive. Average annual rainfall of the Osmanabad district was very less compare to the Satara district. The deficit of the drinking water, reducing level of water, shortage of grain for cattle, food shortage, effects on agriculture, population emigrated searching of water another district.

III) Rainfall Trend in Satara District (1970-2019):-

Rainfall is an important factor, studied by influences the agricultural economy of the locality, because rainfall plays an important role in any agro based region or country. It also controls the cropping pattern, presentation of various agricultural and cultural habits. The analysis of rainfall for the period of 1970-2019 tells that the normal annual rainfall over the district varies from year to year. The average annual rainfall for Satara district is 1522.11 mm and Co-efficient of Rainfall Variability is 19.29 %. The trend line of Satara district was fluctuated frequent time due the less rainfall and high rainfall.

Fig. 3 clearly indicates that the trend line of rainfall in Satara district of Maharashtra state. When we compare to the rainfall distribution of Osmanabad and Satara district then the results clearly indicates that Satara district was comparatively better off in rainfall condition to the Osmanabad district.

Overall, there is a big difference in the average rainfall of Osmanabad and Satara districts. The average rainfall of Satara district is double that of Osmanabad district from the entire period.

Conclusion:-

The study has represented a comprehensive breakdown of rainfall variability and trend of rainfall in Osmanabad and Satara districts. The area in the eastern part of the Osmanabad and Satara districts receiving very less rainfall compare to the other parts of the district. By using 50 years recoded of rainfall in both the district, the study scrutinized the temporal variation of rainfall on a western, central and eastern part of the study area. The main recordings of the study are summarized below.

1. Annual rainfall in the Osmanabad district varies from year to year.
2. Trend analysis of annual average rainfall indicators shows fluctuations in 50 years. During the period of 1972, 1982, 1983, 1992, 1998, 2004 and 2012 shows decreasing trends in Osmanabad district.
3. Satara district receiving more rainfall in all the years compare to the Osmanabad district.
4. Coefficient of variation in Osmanabad district was 28.96 and in Satara district 19.29 was observed in study area.

The main focus in this study has been to understand rainfall variability as a basis for improving the understanding of crop to climate relationships in study region. We analyze impacts of rainfall variability of yields of staple crops and investigate the benefits of rainwater harvesting as a livelihood strategy.

In conclusion, this study has shown that there are significant intra-regional alterations in rainfall amount, inconsistency and trend. In general, rainfall amount is higher and its variability lower, in the western part of the region than in the eastern part. The observed trends in some of the results are thus mainly reliant on local scale climatic controls, rather than large scale climatic making. The results also suggest the need for further investigation local anthropogenic intervention in the environment, which could be one of the major causes of climate change in study regions.

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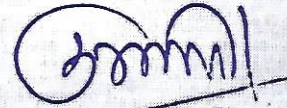
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